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ABSTRACT

Microcomputer software in language arts and mathematics available for use with the first grade curriculum was located, previewed, and evaluated. To obtain a sampling of educational software, a letter requesting all available first grade materials was sent to 50 companies. Of these, 32 companies responded, and 17 had such material. Following the previewing of these programs and additional software being used in the Indiana University Microcomputer Demonstration Laboratory, 14 programs were evaluated using an 11-criteria evaluation instrument derived from a literature review. Data were separated into technical, educational, or management categories for analysis. The study was limited by the subjective nature of the evaluation, the low number of responses from software program producers, and company reluctance to allow material previewing. Programs scored highest in the technical category, with appropriate graphics being the only criterion not met by all programs. Management was deficient only in the adequate tracing of student progress. The educational category scored the lowest, supporting the claim found in the literature that software needs to be developed through the joint efforts of programmers and educators. This study report includes a table listing the software evaluated, and the criteria met by each program, a 12-item bibliography, and an appendix listing companies contacted. (LMM)

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A REVIEW OF FIRST GRADE SOFTWARE MATERIALS

BY

SUSAN PARKER

Submitted in partial fulfillment of the requirements
for the Master of Education degree
in the School of Education
Indiana University
April, 1982

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INTRODUCTION

"All across the country, teachers are discovering that computers can make them more effective. One big reason: Students everywhere are taking to computers like horses to oats." (Computers Storm the Classroom: 46)

A microcomputer is quickly becoming a teacher's best classroom resource and aid. A machine occupying no more space than a large typewriter, is capable of keeping class records, generating student averages, and offering one-on-one instruction to help "Johnny" learn to read. The microcomputer can track student progress enabling the teacher to individualize the classroom more efficiently. The list of uses of a microcomputer appears nearly infinite. However, the microcomputer is only as useful as the program used to run it. The endless capabilities of the microcomputer in the classroom are being hindered by the lack of quality software.

There is an abundance of software on the market. Every day more companies are undertaking the task of producing educational software. Although most companies took a genuine interest in the need for educational software, some companies saw a chance to turn a quick profit. (Quality Software: 34) A major dilemma encountered by both groups is their lack of knowledge in educational needs and strategies. Good educational software requires a knowledge of programming and learning techniques.

Statement of the Problem

Microcomputers are entering the classroom en masse. The teachers cannot ignore them but must put them to the best possible use. Because

a computer is only as effective as the software controlling it, the teacher is faced with a two-fold problem. The first phase involves finding software designed for his or her grade level and subject area, while the second phase deals with judging its usefulness in relation to curricular objectives.

Purpose of the Study

The purpose of the study was to locate and evaluate the software available for use with the first grade curriculum.

Procedure of the Study

To obtain a sampling of educational software, a letter requesting any and all available first grade material was sent to fifty companies (Appendix A). The software being used in the Microcomputer Demonstration Laboratory, Indiana University at South Bend, was also previewed. Only readily prepared software was used. Selection was made according to the publisher's grade level suggestions and content.

The software was separated into two subject areas; Language Arts and Mathematics. The programs were then previewed and evaluated.

The development of the evaluation instrument was the result of a review of several articles dealing with software evaluation. The eleven criteria were chosen because they were found to be common requirements in all the articles.

Limitations of the Study

There were three factors which limited the study. First, the subjective nature of an evaluation of this type can be considered a limitation. The author, however, attempted to remain as objective as possible in previewing all materials.

The second limitation resulted from the response to the letter of request. Of the 50 companies contacted, 32 acknowledged receipt of the letter and 17 companies had material for use at the first grade level. This response substantially reduced the number of available programs.

Many of the companies were reluctant to send copies of their material for preview, thus resulting in the third limitation. Due to the nature of the material and fear of copyright infringement, only four companies offered free preview. Several companies would allow 30 day refunds if materials were ordered on school purchase orders. This policy was not feasible for a study of this type and these materials were not included in this study.

Definition of Terms

Bomb proof - unintentional interruption of a program resulting in termination of the program. (Kansky: 603)

Hardware - general term for the physical components of any computer system.(Computers 82: 86)

Program - a sequence of instructions that a computer follows to perform a specific task. (Grady: 38)

Programmer - the individual who prepares instruction sequences, and who develops the step-by-step operations which are to be performed by the computer in order to solve a problem. (Good: 449)

Software - a collection or group of programs designed to perform a specific function. (Computers 82: 87)

User - person using the computer for learning or instruction.

REVIEW OF RELATED LITERATURE

The review of literature dealt with determining the quality of educational software. There was a general consensus throughout all the articles that quality educational software is software which facilitates learning. With this concept in mind, each article attempted to develop criteria to use in evaluating software.

In the article, "In Search of Good Educational Software" three reasons were given for the shortage of software. First, the industry was unprepared for the large volume of software that was needed. A lack of financing and poor marketing was the second reason. The cost of writing and producing educational software was not as profitable as business software. The third reason for the shortage was that the majority of the marketed software was either written by a programmer who was unfamiliar with educational strategies or by an educator who had very little programming knowledge. It was thought that time would help eliminate causes one and two. As more computers enter the classroom, the market will increase, thereby inviting more companies to engage in the production of software. To resolve the programmer versus educator dilemma, a team, consisting of a programmer and a teacher should be involved in writing software. (In Search of Good Educational Software: 51)

While there is a shortage of good quality educational software, some good software does exist. Wade points out that different kinds of software serve different purposes. Not all programs should do all things. Roblyer claims that the standards developed need to be flexible to meet the differing needs of students. There are three areas of concern in developing these standards. These three areas are technical, educational and management.

The technical area deals with the microcomputer's capabilities. The use of sound and graphics should add to learning, not be distracting. Karsky, Heck, and Johnson also questioned whether the program is "bomb proof."

The educational aspect looked at several ideas. First, the program should be free of grammar and spelling mistakes for it to be considered educationally correct. Wade and "Quality Software" looked at learning guidance. They contended that help should be provided for understanding wrong answers. Wade and Roblyer pointed out that this help was not necessary for every program but depended on the purpose of the program. All articles reviewed called for clearly written and appropriate prerequisite skills. Providing feedback drew some varied responses. Roblyer contended that feedback needs to be tailored to the child and type of lesson. Sometimes continuing the lesson is appropriate feedback as opposed to seeing a happy face with each correct response. "Quality Software" warned users of the use of negative reinforcement. The rewards for right answers should be more appealing than those for wrong. (Level Headed Guide to Software Evaluation: 23) All articles seemed to concur that the general purpose of the feedback was to encourage learning.

The last area in evaluating software is management. Management refers to the operating manual, record keeping abilities, and modification ability. A microcomputer was intended to help the teacher, so the management routines should make his or her job easier. "A Level Headed Guide to Software Evaluation" and "Quality Software" questioned whether directions were written in understandable language.

Both articles called for record keeping that helped the teacher track the student's progress efficiently. The third management consideration questioned whether a teacher could easily modify a program to fit his or her need. A flexible program allows the teacher the option to modify the program to fit the differing needs of the students. (Heck, Johnson, and Kansky: 14)

Using these criteria to evaluate a program will help a teacher make a decision. Kansky, Heck and Johnson close with this thought: "The classification of an item of software as good or bad (useful or useless) is, in the final analysis, a professional judgement." (p. 603) Only the teacher knows what will work in his or her classroom.

ANALYSIS OF THE DATA

The analysis of the data was divided into three areas. These areas were technical, educational, and management. Each area contained criteria used to evaluate the programs. These criteria were chosen because they were found to be common requirements in several articles dealing with software evaluation. A composite listing of the software evaluated and the criteria met by each is presented in Table 1. A bar graph was constructed for each area, showing the number of programs meeting the criteria. A percentage was also figured to aid in the comparison.

Technical

The technical area rated the highest of the three areas. All of the programs reviewed made use of the machines capabilities and were found to be bomb proof. As indicated in Figure 1, only 78.6% of the programs used sound and graphics appropriately. The use of graphics by the programs not meeting this criteria distracted the user's attention. The focus of the exercise on the screen was interrupted and delayed by the graphics. This interruption could hinder a child in learning by disrupting his/her concentration.

FIGURE 1: NUMBER OF PROGRAMS MEETING TECHNICAL CRITERIA

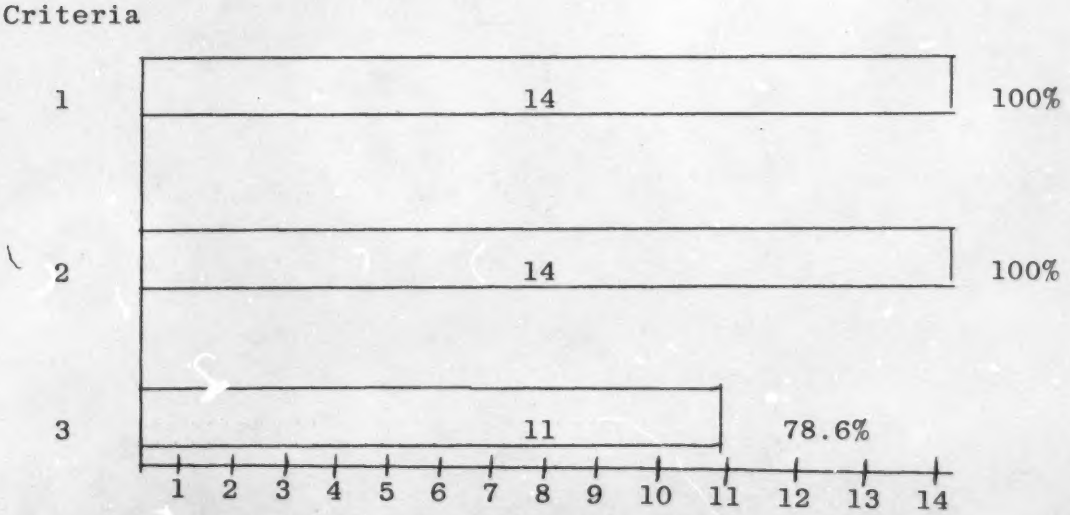


Table 1

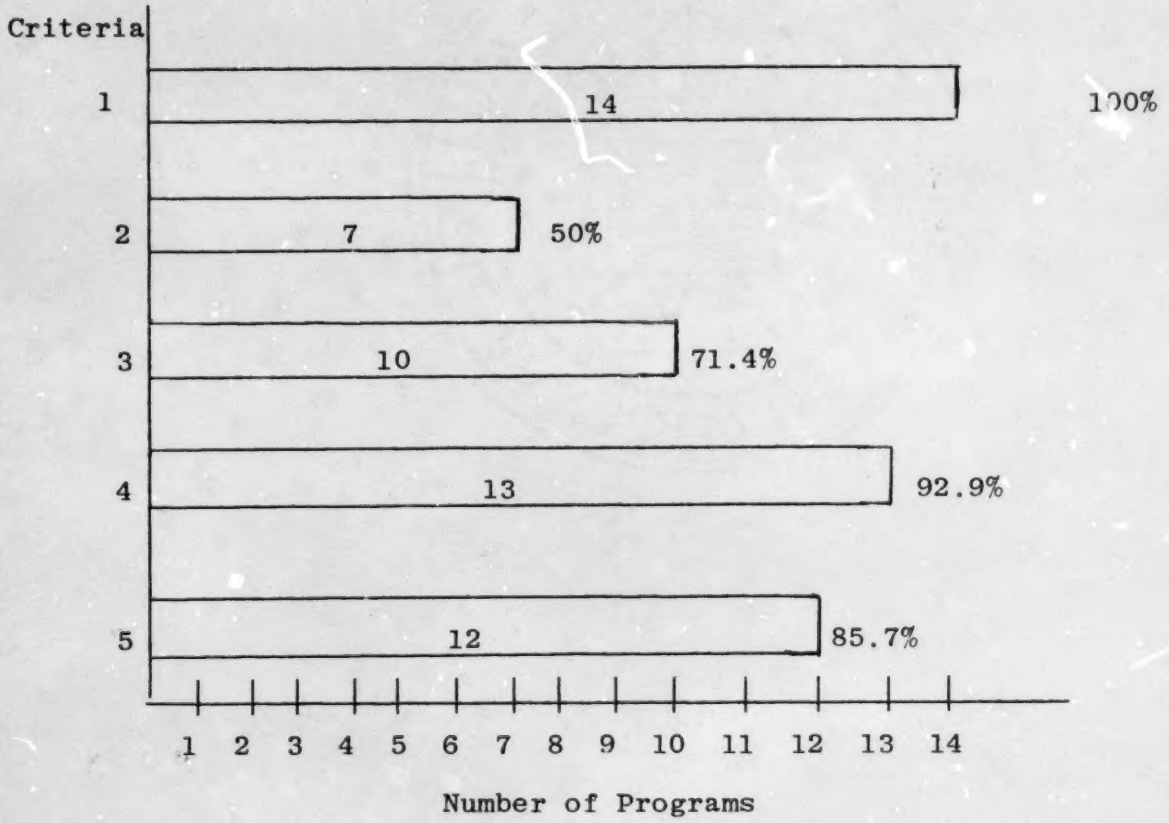
Software Evaluation

TECHNICAL	Intro. to Math	Clock	Presc. Math Drill	Math Basketball	Math Darts	Basc. Facts & Games	Time	Fundamental Math	Missing Math Facts	Who, What, When, Where	Consonant Blends	Show and Spell	Dieting Dinosaurs	Alphabet Keyboard	
1. Make use of machine's capabilities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2. Bomb proof	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3. Use of graphics and sound appropriate		X	X	X	X	X	X	X			X	X	X	X	
EDUCATIONAL															
1. Educationally correct (spelling, grammar)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2. Provide help in understanding wrong answers	X		X	X				X	X			X		X	
3. Appropriate prerequisite skills		X	X	X		X	X	X			X	X	X	X	
4. Objective(s) clear and appropriate	X	X	X	X		X	X	X	X	X	X	X	X	X	
5. Feedback encourages learning	X	X	X	X		X	X	X		X	X	X	X	X	
MANAGEMENT															
1. Directions easy to understand and follow	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2. Help teachers in tracking student progress	X	X	X				X	X	X	X	X			X	
3. Flexible to meet differing needs of students	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Educational

The educational section appeared to be the weakest. This finding corresponds with the claim that most educational software has been written by programmers without a working knowledge of educational techniques. ("Quality Software": 34) Figure 2 provides a summary of the five criteria evaluated in the educational area.

FIGURE 2: NUMBER OF PROGRAMS MEETING EDUCATIONAL CRITERIA



Only 50% of the programs were able to satisfy the requirements for criteria 2; providing help in understanding wrong answers. This was the lowest score received in any of the areas evaluated. The programs failing to meet this criteria would either tell a student their answer was wrong and continue with the next exercise or repeat the question. In the programs where the question was repeated, the user was given two chances to enter a correct answer. If the user was still unsuccessful, the right answer was displayed.

A program which does not provide help in understanding wrong answers is not necessarily a poor program. If the intention of the program is to provide drill, then diagnosing and instructing the student could be deemphasized. However, when the student is confronted with the same problem and consistently misses it, the child is practicing a wrong procedure or answer several times. This repeated mistake may increase the difficulty in learning because the wrong behavior has to be unlearned before the right behavior can be learned.

71.4% of the programs were found to have appropriate prerequisite skills. All four programs which were found inappropriate in this area required reading using a vocabulary above first grade. Two of the programs used sentences for positive reinforcement when a correct response was given. This created a problem, for if the student could not read the sentence, he or she would have no way of knowing if they had been correct.

Criteria four refers to clear and appropriate objectives. The objectives were clearly stated in all programs. One program was

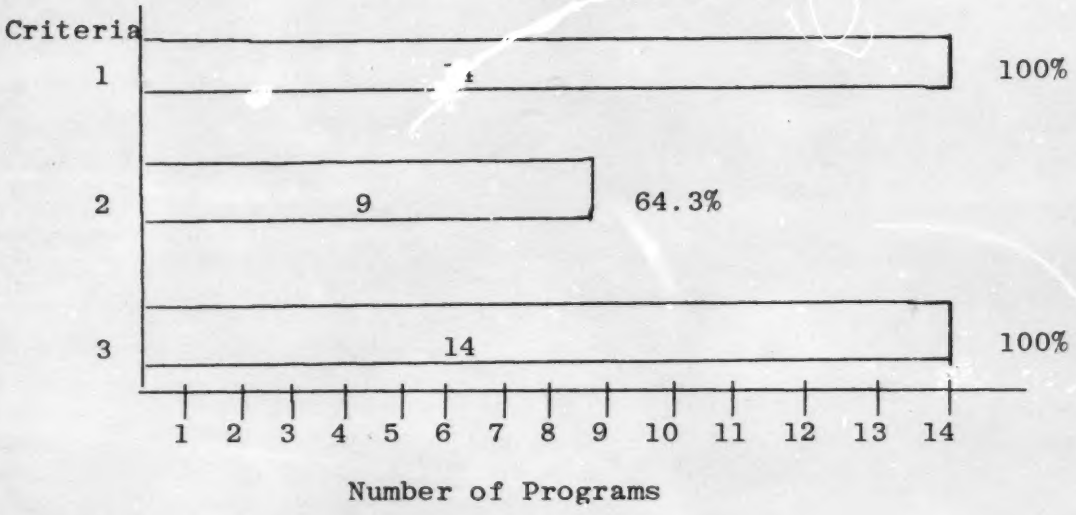
determined to have an inappropriate objective. User responses were timed and no credit was given for a correct response if the user took too long to answer. This type of reinforcement is frustrating for a slower student or a student who is just learning the concept.

The final criteria in the educational area questioned whether or not the feedback a user received encouraged learning. The rewards or feedback given for correct responses were more appealing than feedback encountered with an incorrect response in 85.7% of the programs. Inappropriate feedback and penalties imposed on the user for correct responses were the two problems found in this area.

Management

The third and final area of evaluation considered the management of the program. As seen in Figure 3, criteria 1 and 3 were met in all programs. Criteria 1 looked at the manual and directions and rated the ease in understanding them. Flexibility in meeting students' needs was evaluated in criteria 3.

FIGURE 3: NUMBER OF PROGRAMS MEETING MANAGEMENT CRITERIA



Helping teachers track student progress was the second lowest criteria found in the study. This deficit in a program can cause a considerable problem. A teacher needs to know at what level a student is working in order to optimally meet his or her needs. If there is no record of a student's scores or mistakes, a teacher has no way of telling if a problem exists or where it is. This defeats the purpose of the microcomputer as a teacher's helper because the teacher is given no information as to what has been accomplished by the child.

SUMMARY

As more and more microcomputers enter the classroom, the need for good quality software increases. It is up to the classroom teacher to find and evaluate software to use in his or her classroom. Research has indicated there is a lack of good quality software available for first grade.

Out of 50 companies contacted, only 17 acknowledged having first grade materials. Many of these companies were reluctant to send materials for preview due to copyright infringement.

A review of literature on software evaluation indicated that the ultimate goal of good quality software should be to facilitate learning. The literature called for a minimum criteria to be developed for the purpose of evaluating software with a teacher's professional judgement being the final determining factor in software quality.

An evaluation instrument was developed as a result of this review and used to evaluate the materials received for this study.

The data was separated into three categories for analysis. The technical category scored the highest in the evaluation with the appropriate use of graphics being the only criteria not met by all programs.

The educational category scored the lowest of the three categories. This finding reaffirmed the claim found in the review of literature, that many programs are being written by programmers who are not truly knowledgeable of educational needs and strategies. Half of the programs evaluated did not provide help in understanding

wrong answers and slightly more than one-fourth did not have appropriate prerequisite skills.

Management, the third evaluation category was found deficient on only one criteria. Approximately one-third of the programs did not provide adequate tracking of student progress. This deficiency reduces the effect of the microcomputer in the classroom as an aid to learning.

CONCLUSION

It was concluded that the educational portion of the software was the weakest of the three areas. Choosing appropriate pre-requisite skills and providing help in understanding mistakes greatly contribute to the strength of the learning activity. The data indicated these criteria to be inadequate, thus resulting in the low rating for this area.

It was also concluded that software needs to be developed by people who are highly knowledgeable of programming as well as educational needs and strategies. The coordination of appropriate skills and technical features result in the production of better quality software.

RECOMMENDATIONS

As a result of this study, the following recommendations are made:

1. Teachers need to carefully assess their needs in determining the quality of software.
2. All software should be previewed before it is purchased. The quality of the software should sell the software. Serious questions should be raised about companies refusing any type of preview.
3. Educators and programmers should work together to produce good quality software. A joint effort of this kind will help to eliminate some of the poor materials.
4. Teachers need to become aware of what to look for in software. Teachers will be called on to make the final judgement of the software as they have on all other learning materials used in their classrooms.

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Good, Carter V., Editor, Dictionary of Education, 3rd edition, McGraw-Hill Co., New York, 1973, 681 pp.

Grady, David, "The Key Word is Learn; The Key Word is Now...The Key Person is You," Learning, 10:24, 28, 30, 38, 44, 48, 52, January, 1982.

Heck, William P., Johnson, Jerry, and Kansky, Robert J., Guidelines for Evaluating Computerized Instructional Materials, The National Council of Teachers of Mathematics, Inc., Reston, 1981, 30 pp.

"Getting Hard-Nosed About Software," Mathematics Teacher, 74:600-604, November, 1981.

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"Quality Software," Electronic Learning, 1:33-36, November-December, 1981.

Roblyer, M.O., "When is it 'Good Courseware'?" Educational Technology, 20:47-54, October, 1981.

Wade, T.E., Jr., "Evaluating Computer Instructional Programs and Other Teaching Units," Educational Technology, 20:32-35, November, 1980.

APPENDIX

APPENDIX A

List of Companies Contacted

Company	Responded	First Grade Materials
Activity Resources Co., Inc. P.O. Box 4875 Hayward, CA 94540		
Addison-Wesley Publishing Co. 2725 Sand Hill Road Menlo Park, CA 94025	X	X
Basics & Beyond, Inc. P.O. Box 10 Amawalk, NY 10501	X	
Bertamax, Inc. Suite 550 101 Nickerson Street Seattle, WA 98109		
Bluebird's Computer Software 2267 23rd Street Wyandotte, MI 48192		
Borg-Warner Educational Systems 600 W. University Drive Arlington Heights, IL 60004	X	
Charles Mann & Associates Microsoftware Division 55722 Sante Fe Trail Yucca Valley, CA 92284	X	
Compak, Inc. 10309 Talleyran Drive Austin, TX 78750		
Computer Assisted Instruction 6115 28th Street, S.E. Grand Rapids, MI 49506	X	
Creative Computing Sensational Software 39 E. Hanover Avenue Morris Plains, NJ 07950		

Company	Responded	First Grade Materials
Creative Publications P.O. Box 10328 Palo Alto, CA 94303	X	
Curriculum Applications P.O. Box 264 Arlington, MA 02174	X	X
Dallas Independent School District Marketing Department 2517 S. Ervay Dallas, TX 75215		
Disney Electronics 6153 Fairmount Avenue San Diego, CA 92120		
Dynacomp, Inc. 1427 Monroe Avenue Rochester, NY 14618	X	X
Educational Activities, Inc. 1937 Grand Avenue Baldwin, NY 11510	X	X
Edu-Soft 4639 Spruce Street Philadelphia, PA 19139		
Eye-Gate Media 146-01 Archer Avenue Jamaica, NY 11435		
Hartley Courseware, Inc. P.O. Box 431 Dimondale, MI 48821	X	X
Hayden Book Co., Inc. 50 Essex Street Rochelle Park, NY 07662	X	
Holt, Rinehart & Winston School Marketing Dept. 383 Madison Avenue New York, NY 10017	X	

Company	Responded	First Grade Materials
Instant Software Peterborough, NH 03458	X	
J.L. Hammett Co., Inc. Hammett Pl. P.O. Box 545 Braintree, MA 02184		
K-12 MicroMedia P.O. Box 17 Valley Cottage, NY 10989		
Krell Software Corporation 21 Milbrook Drive Stony Brook, NY 11790	X	
Learning Tools, Inc. 4 Washburn Place Brookline, MA 02146		
Level IV Products, Inc. 32461 Schoolcraft Street Livonia, MI 48150		
McGraw-Hill 1221 Avenue of the Americas New York, NY 10020	X	
MED System Software P.O. Box 2674 Chapel Hill, NC 27514	X	X
Microcomputer Education Applications Network (MEAN) 256 N. Washington Street Falls Church, VA 22046		
Microcomputer Workshops 103 Puritan Drive Port Chester, NY 10573	X	X
Micro-Ed., Inc. P.O. Box 24156 Minneapolis, MN 55424	X	X

Company	Responded	First Grade Materials
MicroGnome 5843 Montgomery Road Elkridge, MD 21227	X	
Micro Learningware P.O. Box 3124 North Mankato, MN 56001	X	X
Milleken Publishing Co. Computer Department 1100 Research Boulevard Saint Louis, MO 63132	X	X
Minnesota Educational Computing Consortium (MECC) 2520 Broadway Drive Saint Paul, MN 55113	X	X
Opportunities for Learning 8050 Lurline Avenue Department L5 Chatsworth, CA 91311	X	
Program Design, Inc. 11 Idar Ct. Greenwich, CT 06830	X	X
Quality Educational Designs P.O. Box 12486 Portland, OR 97212	X	
Radio Shack Education Div. 400 Tandy Atrium Fort Worth, TX 76102		
Random House High School Division Suite 201 2970 Brandywine Road Atlanta, GA 30341	X	X
Scholastic Inc. 904 Sylvan Avenue Englewood Cliffs, NJ 07632	X	

Company	Responded	First Grade Materials
Science Research Associates SRA 155 N. Wacker Drive Chicago, IL 60606	X	X
Scott Foresman and Co. 1900 E. Lake Avenue Glenview, IL 60025	X	X
Sterling Swift Publishing 1600 Fortview Road Austin, TX 78704	X	
Society for Visual Education SVE Department EL 1 1345 Diversy Parkway Chicago, IL 60614	X	X
Sunburst Communications 39 Washington Avenue Pleasantview, NY 10570		
Texas Instruments, Inc. P.O. Box 53 Lubbock, TX 79408		
Two Star Systems Room 235 10 Park Place Morristown, NJ 07960		
Wise Owl Workshop 1168 Avenida de Las Palmas Livermore, CA 94550	X	X

APPENDIX B

List of Programs Reviewed

Educational Activities

1. Introduction to Math
2. Missing Math Facts

Hartley Courseware

1. Clock
2. Prescriptive Math Drill
3. Who, What, When, Where
4. Consonant Blends

Addison-Wesley

1. Math Basketball
2. Math Darts

Curriculum Applications

1. Dieting Dinosaurs

Random House

1. Basic Math Facts and Games
2. Time
3. Fundamental Math
4. Show and Spell
5. Alphabet Keyboard